UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P O Box 1450
Alexandria, Virginia 22313-1450
www uspto gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/674,081	09/29/2003	Richard M. H. New	HSJ920030174US1	2173

7590 09/18/2008

John L. Rogitz
Rogitz & Associates
Suite 3120
750 B Street
San Diego, CA 92101

EXAMINER	
PEIKARI, BEHZAD	

ART UNIT	PAPER NUMBER
2189	

MAIL DATE	DELIVERY MODE
09/18/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/674,081
Filing Date: September 29, 2003
Appellant(s): NEW ET AL.

John L. Rogitz
For Appellant

SUPPLEMENTAL EXAMINER'S ANSWER

This is in response to the reply brief filed June 11, 2008 appealing from the Office action mailed February 6, 2008 and Examiner's Answer mailed April 29, 2008.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

2002/0071198	LIU et al.	6-2002
2003/0147167	ASANO et al.	8-2003
5,367,669	HOLLAND et al.	11-1994
5,872,905	ONO et al.	2-1999
6,212,047	PAYNE et al.	4-2001
10/674,093	KASIRAJ et al.	9-2003

Rosenblum et al., "The Design and Implementation of a Log-Structured File System", Proceedings of the 13th ACM Symposium on Operating Systems Principles and the Feb. 1992 ACM Transactions on Computer Systems; pages 1-15, July 24, 1991.

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Double Patenting

1. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir.

1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

2. Claim 18 is provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 9 of copending Application No. 10/674/093 (hereinafter, '093) in view of Rosenblum et al. ("The Design and Implementation of a Log-Structured File System", 1991, hereinafter Rosenblum) and Holland et al. (US Pat. 5,367,669, hereinafter Holland).

This is a provisional obviousness-type double patenting rejection.

Although the conflicting claims are not identical, they are not patentably distinct from each other because the copending claims anticipate the instant claims. A later patent claim is not patentably distinct from an earlier patent claim if the later claim is obvious over, or anticipated by, the earlier claim. In re Longi, 759 F.2d at 896, 225 USPQ at 651 (affirming a holding of obviousness-type double patenting because the claims at issue were obvious over claims in four prior art patents); In re Berg, 140 F.3d at 1437, 46 USPQ2d at 1233 (Fed. Cir. 1998) (affirming a holding of obviousness-type double patenting where a patent application claim to a genus is anticipated by a patent claim to a species within that genus). ELI LILLY AND COMPANY v BARR

LABORATORIES, INC., United States Court of Appeals for the Federal Circuit, ON PETITION FOR REHEARING EN BANC (DECIDED: May 30, 2001).

Claim 9 of the '093 application shows all the limitations of claim 18 of the instant application except a log-structure file-system for storing files and a RAID system with a RAID controller coupled to each disk.

Rosenblum shows a log-structured file system for storing files (page 3, left hand column, lines 36-41 through right hand column, lines 1-2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the log-structured file system of Rosenblum in the disk storage system of the '093 application, since (1) the Rosenblum system was specifically designed to be implemented in disk storage systems, such as that of the '093 application (see Rosenblum, page 1, left hand column, lines 1-4) and (2) such a combination would have achieved faster file writing and crash recovery (see Rosenblum, page 1, left hand column, lines 4-7 and page 9, right hand column, lines 14-30).

Holland shows a RAID system including a RAID means for controlling (RAID controller **8**) (figure 1 and column 2, lines 66-68 through column 3, lines 1-6) and a plurality of hard disk drives (hard disk drive array) with the RAID controller being coupled to each of the disk drives (figure 1 and column 2, lines 43-51).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have a RAID means for controlling and RAID system as taught by Holland using the disk system taught by the above combination of claim 9 of

'093 and Rosenblum in the RAID configuration, since (1) the Holland system was specifically designed to be used with disk drive systems, such as that of the '093 / Rosenblum combination described above (see Holland, figure 1) and (2) such a combination would have enabled recovery of information stored on a disk in the event of a disk drive failure (see Holland column 1, lines 29-31).

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-4 and 6-9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The language "A cumulative ECC parity state between successive partial writes of an ECC block is retained" is vague and unexplained either in the context of the claims or in the specification, as explained below.

First, it is unclear what is meant by "ECC parity", and even less clear what is meant by an "ECC parity state". Second, it is unclear how a "state" can be "cumulative".

In the specification, there are only two places where ECC is ever mentioned:

- In the first full paragraph of page 4, "A cumulative ECC parity state between successive partial writes of an ECC block is retained". Since this language is repeated verbatim in claim 1, page 4 provides the necessary

antecedent basis; however, there is no further explanation of what it actually means.

- In the third full paragraph on page 10, is written, “large error correction (ECC) block sizes within each segment (band) are implemented by storing the intermediate ECC parity state after each partial write of an ECC block". This language teaches that only *intermediate* parity states are stored after partial writes. There is no explanation of how any accumulation and/or summation of states occurs to lead to "A cumulative ECC parity state".

“ECC” and “parity” were well known terms of art. “ECC” means “error correction code”, and provided both error detection and correction of data in memory. “Parity” was an earlier, simpler form which provided error detection only, but such detection was almost universally used to facilitate a subsequent correction. However, “ECC parity” *per se* is not a term of art, nor has it been defined in appellant’s disclosure. In the absence of any clear definition of “ECC parity” or “ECC parity state”, the examiner has interpreted this to mean that portion of an ECC devoted to parity data (i.e. error detection).

Given the examiner's interpretation of “ECC parity”, storing the intermediate ECC parity state after each partial write of an ECC block makes perfect sense. What does not make sense is how such states can be made *cumulative*. Did appellant mean to say that the ECC parity states are carried through some type of sequence? If so, then this feature has not been properly claimed. If not, then where does the accumulation occur and how can something be added to a "state"? Or did appellant mean that the

error detection data itself, as opposed to a state, is accumulated after each partial write? Neither the claims nor the disclosure is clear on this point.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 1, 2, and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al. (US PGPub. 2002/0071198, hereinafter Liu) in view of Rosenblum in view of Asano et al. (US PGPub 2003/0147167, hereinafter Asano).

(A) Regarding claim 1, Liu taught a hard disk drive (HDD) comprising:

at least one rotatable disk (page 3, right hand column, lines 26-28);

at least one write element (transducer) configured for writing data to the disk (page 3, right hand column, lines 28-30) in isolated tracks (page 6, right hand column,

lines 8-13) and in bands, wherein at least two tracks establish a band (plurality of adjacent tracks) (page 6, left hand column, lines 35-52); and

at least one HDD controller controlling the write element (page 7, paragraph 73), wherein segments of data (grouping of data written sequentially) corresponds to a respective band or respective isolated track (page 6, paragraph 67 and paragraph 70) and an embedded file system is used in reading and writing data (page 6, paragraph 69).

However, Liu does not disclose the file system being a log-structured file system with segments.

Rosenblum shows a log-structured file system (page 3, left hand column, lines 36-41 through right hand column, lines 1-2) wherein the file system defines segments for writing groupings of sequential data (page 4, right hand column, lines 14-19) that speeds up file writing and crash recovery.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the log-structured file system of Rosenblum in the disk storage system of Liu such that each segment corresponds to an isolated track or a band of tracks since (1) the Rosenblum system was specifically designed to be implemented in disk storage systems, such as that of Liu (see Rosenblum, page 1, left hand column, lines 1-4) and (2) such a combination would have achieved faster file writing and crash recovery (see Rosenblum, page 1, left hand column, lines 4-7 and page 9, right hand column, lines 14-30; note also the chart on page 6).

However, the combination of Liu and Rosenblum does not show the use of error correction code.

Asano discloses, in a magnetic disk storage system wherein data is written one sector at a time (page 3, paragraph 28), using an error correction code (ECC) block size larger than a physical sector size of the disk (page 5, paragraph 63), a cumulative ECC parity state (interpreted for purposes of this rejection as being cumulative ECC *data*, more specifically, the parity or error detection portion of such ECC data) between partial writes (i.e., after writing to each sector) of an ECC block being retained (note the summation of the check bytes in page 8, paragraphs 107 and 108).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the ECC structure and operations of Asano in the disk system of the combination of Liu and Rosenblum such that the log-structured file system uses the error correction code, since (1) the Asano system was specifically designed to be implemented in disk storage systems such as the Liu and Rosenblum combination (see Asano, figure 1) and (2) such a combination would have provided protection against burst errors and random errors without incurring the delays of read-modify-write operations when sequentially writing large amounts of data (see Asano, page 8, paragraph 107).

(B) Regarding claim 2, the combination of Liu, Rosenblum, and Asano teaches all the limitations of claim 1 as shown above, and Liu shows that at least some bands include at least three contiguous tracks (see Liu, figure 13 and paragraph 68).

(C) Regarding claim 4, the combination of Liu, Rosenblum, and Asano teaches all the limitations of claim 1 as shown above, and Liu discloses that the tracks within a band (data block) are shingled (see Liu, figure 13 and page 6, paragraph 68).

7. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Liu, Rosenblum, and Asano as applied to claim 1 above, and further in view of Payne et al. (US Pat. 6,212,047, hereinafter Payne).

Regarding claim 3, the combination of Liu, Rosenblum, and Asano teaches all the limitations of claim 1 as shown above but does not disclose the write element being configured for perpendicular recording.

Payne, however, shows a magnetic disk system wherein the write element is configured for perpendicular recording (column 3, lines 45-62).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the configuration of the write element for perpendicular recording as taught by Payne in the disk system of the combination of Liu, Rosenblum, and Asano since (1) the Payne system was designed for use in disk storage systems, such as that of Liu, Rosenblum, and Asano and (2) such a combination would have achieved high density storage with good stability on magnetic disk storage (see Payne, column 2, lines 3-11).

8. Claims 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Liu, Rosenblum, and Asano as applied to claim 1 above, and further in view of Ono et al. (US Pat. 5,872,905, hereinafter Ono).

(A) Regarding claim 6, the combination of Liu, Rosenblum, and Asano teaches all the limitations of claim 1 as shown above, and Liu shows shingled track writing (page 6, left hand column, lines 35-45). The combination of Liu, Rosenblum, and Asano does not disclose using a virtual address table when writing to the disk.

However, virtual address tables were well known in disk storage systems. Ono teaches using a virtual address table (translation table) for accessing a magnetic disk wherein a virtual sector is assigned a replacement sector when a sector originally mapped to the virtual sector is corrupted (column 17, lines 34-44).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the virtual address table of Ono in the disk writing procedure of the combination of Liu, Rosenblum, and Asano, since (1) Ono was specifically designed to be used with disk storage, such as that of the combination of Liu, Rosenblum, and Asano (see Ono, Figure 1, element 4) and (2) such a combination would have maintained the integrity of the data being stored on a magnetic disk storage apparatus without complicating the logic of the devices accessing the storage apparatus (Ono, column 17, lines 41-50).

(B) Regarding claim 7, the combination of Liu, Rosenblum, Asano, and Ono teaches all the limitations of claim 6 as shown above, and Ono shows that the VAT

(translation table) maps virtual sector locations to actual sector locations (column 17, lines 26-40).

(C) Regarding claim 8, the combination of Liu, Rosenblum, Asano, and Ono teaches all the limitations of claim 6 as shown above, and Ono discloses that the VAT is stored in a location on the disk (column 17, lines 34-40). Furthermore, Liu shows that the storage locations on the disk consist of a region with non-overlapping tracks where random access writes can be performed, and a region with shingled written bands (page 6, paragraph 67). Additionally, Rosenblum shows that storage operations use a log structured approach (page 3, left hand column, lines 36-41 through right hand column, lines 1-2).

9. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Liu, Rosenblum, Asano, and Ono as applied to claim 6 above, and further in view of Holland et al.

Regarding claim 9, the combination of Liu, Rosenblum, Asano, and Ono teaches all the limitations of claim 6 as shown above, as well as remapping sectors as required by an access to the disk (Ono, column 17, lines 34-44) wherein accessing the disk includes shingled track writing (Liu, page 6, left hand column, lines 35-45). However, the combination of Liu, Rosenblum, Asano, and Ono does not teach the hard disk being part of a RAID system.

Holland shows a RAID system including a RAID controller (figure 1 and column 2, lines 66-68 through column 3, lines 1-6) wherein the RAID controller (I/O Process

Manager software run on RAID controller) performs the logical to physical address translation for accesses to a hard disk (column 4, lines 57-61).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have a RAID controller and system as taught by Holland using the disk system taught by the combination of Liu, Rosenblum, Asano, and Ono in the RAID configuration, since (1) the Holland system was specifically designed to be used with disk drive systems, such as that of the combination of Liu, Rosenblum, Asano, and Ono described above (see Holland, figure 1) and (2) such a combination would have enabled recovery of information stored on a disk in the event of a disk drive failure (Holland, column 1, lines 29-31).

10. Claims 10, 11, 15, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu in view of Rosenblum and further in view of Ono.

(A) Regarding claim 10, Liu shows a hard disk drive (HDD) comprising:

disk means for storing data (page 3, right hand column, lines 26-28);

means for writing data to the disk (transducer) (page 3, right hand column, lines 28-30) in tracks (page 6, right hand column, lines 8-13) and in bands, wherein at least two tracks establish a band (plurality of adjacent tracks) (page 6, left hand column, lines 35-52) and wherein at least some bands are shingled (page 6, paragraph 68); and

means for controlling the means for writing (page 7, paragraph 73), wherein an embedded file system is used in reading and writing data (page 6, paragraph 69).

Liu also shows shingled track writing (page 6, left hand column, lines 35-45).

Liu does not disclose the file system being a log-structured file system.

However, Rosenblum shows the use of a log-structured file system for recording sequential data (page 3, left hand column, lines 36-41 through right hand column, lines 1-2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the log-structured file system of Rosenblum in the disk storage system of Liu such that each segment corresponds to an isolated track or a band of tracks since (1) the Rosenblum system was specifically designed to be implemented in disk storage systems, such as that of Liu (see Rosenblum, page 1, left hand column, lines 1-4) and (2) such a combination would have achieved faster file writing and crash recovery (see Rosenblum, page 1, left hand column, lines 4-7 and page 9, right hand column, lines 14-30; note also the chart on page 6).

The combination of Liu and Rosenblum does not disclose using a virtual address table when writing to the disk.

However, Ono teaches using a virtual address table (translation table) for accessing a magnetic disk wherein a virtual sector is assigned a replacement sector (remapping) when a sector originally mapped to the virtual sector is corrupted (column 17, lines 34-44).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the virtual address table of Ono in the disk writing procedure of the combination of Liu and Rosenblum, since (1) Ono was specifically designed to be used with disk storage, such as that of the combination of Liu

and Rosenblum (see Ono, Figure 1, element 4) and (2) such a combination would have maintained the integrity of the data being stored on a magnetic disk storage apparatus without complicating the logic of the devices accessing the storage apparatus (Ono, column 17, lines 41-50).

(B) Regarding claim 11, the combination of Liu, Rosenblum, and Ono teaches all the limitations of claim 10 as shown above, and Liu shows that at least some bands include at least three contiguous tracks (see Liu, figure 13 and paragraph 68).

(C) Regarding claim 15, the combination of Liu, Rosenblum, and Ono teaches all the limitations of claim 10 as shown above, and Ono shows that the VAT (translation table) maps virtual sector locations to actual sector locations (see Ono, column 17, lines 26-40).

(D) Regarding claim 16, the combination of Liu, Rosenblum, and Ono teaches all the limitations of claim 10 as shown above, and Ono discloses that the VAT is stored in a location on the disk (Ono, column 17, lines 34-40). Furthermore, Liu shows that the storage locations on the disk consist of a region with non-overlapping tracks where random access writes can be performed, and a region with shingled written bands (see Liu, page 6, paragraph 67). Additionally, Rosenblum shows that storage operations use a log structured approach (see Rosenblum, page 3, left hand column, lines 36-41 through right hand column, lines 1-2).

11. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Liu, Rosenblum, and Ono as applied to claim 10 above, and further in view of Payne.

Regarding claim 12, the combination of Liu, Rosenblum, and Ono teaches all the limitations of claim 10 as shown above but does not disclose the means for writing being configured for perpendicular recording.

Payne shows a magnetic disk system wherein the means for writing is configured for perpendicular recording (column 3, lines 45-62).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the configuration of the means for writing for perpendicular recording as taught by Payne in the disk system of the combination of Liu, Rosenblum, and Ono, since (1) the Payne system was designed for use in disk storage systems, such as that of Liu, Rosenblum, and Ono and (2) such a combination would have achieved high density storage with good stability on magnetic disk storage (see Payne, column 2, lines 3-11).

12. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Liu, Rosenblum, and Ono as applied to claim 10 above, and further in view of Asano.

Regarding claim 13, the combination of Liu, Rosenblum, and Ono teaches all the limitations of claim 10 as shown above but does not show the use of error correction code.

Asano discloses, in a magnetic disk storage system wherein data is written one sector at a time (page 3, paragraph 28), using an error correction code (ECC) block size larger than a physical sector size of the disk (page 5, paragraph 63), a cumulative ECC parity state between partial writes of an ECC block being retained (page 8, paragraphs 107 and 108).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the ECC structure and operations of Asano in the disk system of the combination of Liu, Rosenblum, and Ono such that the log means uses the error correction code, since (1) the Asano system was specifically designed for use in disk storage, such as that of the combination of Liu, Rosenblum, and Ono (see Asano, figure 1) and (2) such a combination would have provided protection against burst errors and random errors without incurring the delays of read-modify-write operations when sequentially writing large amounts of data (Asano, page 8, paragraph 107).

13. Claims 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu in view of Rosenblum and Holland.

(A) Regarding claim 18, Liu shows a hard disk drive comprising:

at least one storage disk (page 3, right hand column, lines 26-28);

at least one disk controller controlling reading data from and writing data to the disk (page 7, paragraph 73), wherein the drive controller writes data in shingled bands

(data groups) (page 6, paragraph 68) and an embedded file system is used in reading and writing data (page 6, paragraph 69).

However, Liu does not disclose the file system being a log-structured file system.

Rosenblum shows a log-structured file system (page 3, left hand column, lines 36-41 through right hand column, lines 1-2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the log-structured file system of Rosenblum in the disk storage system of Liu, since (1) the Rosenblum system was specifically designed to be implemented in disk storage systems, such as that of Liu (see Rosenblum, page 1, left hand column, lines 1-4) and (2) such a combination would have achieved faster file writing and crash recovery (see Rosenblum, page 1, left hand column, lines 4-7 and page 9, right hand column, lines 14-30; note also the chart on page 6).

However, the combination of Liu and Rosenblum does not show a RAID system.

Holland shows a RAID system including a RAID means for controlling (RAID controller 8) (figure 1 and column 2, lines 66-68 through column 3, lines 1-6) and a plurality of hard disk drives (hard disk drive array) with the RAID controller being coupled to each of the disk drives (figure 1 and column 2, lines 43-51) wherein the RAID means for controlling (I/O Process Manager software run on RAID controller) performs the logical to physical address translation for accesses to a hard disk (column 4, lines 57-61).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have a RAID means for controlling and RAID system as taught by Holland using the disk system taught by the combination of Liu and Rosenblum in the RAID configuration, since (1) the Holland system was specifically designed to be used with disk drive systems, such as that of the Liu / Rosenblum combination described above (see Holland, figure 1) and (2) such a combination would have enabled recovery of information stored on a disk in the event of a disk drive failure (see Holland column 1, lines 29-31).

(B) Regarding claim 19, the combination of Liu, Rosenblum, and Holland teaches all the limitations of claim 18 as shown above, and Liu shows that at least some bands include at least three contiguous tracks (Liu, figure 13 and paragraph 68).

14. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Liu, Rosenblum, and Holland as applied to claim 19 above, and further in view of Payne.

Regarding claim 20, the combination of Liu, Rosenblum, and Holland teaches all the limitations of claim 19 as shown above but does not disclose the disk drives being configured for perpendicular recording.

Payne shows a magnetic disk system wherein a disk drive is configured for perpendicular recording (column 3, lines 45-62).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the configuration of disk drives for

perpendicular recording as taught by Payne in the RAID system of the combination of Liu, Rosenblum, and Holland, since (1) the Payne system was designed for use in disk storage systems, such as that of Liu, Rosenblum, and Holland and (2) such a combination would have achieved high density storage with good stability on magnetic disk storage (see Payne, column 2, lines 3-11).

15. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Liu, Rosenblum, and Holland as applied to claim 19 above, and further in view of Asano et al. (US PGPub 2003/0147167, hereafter Asano).

Regarding claim 21, the combination of Liu, Rosenblum, and Holland teaches all the limitations of claim 19 as shown above but does not show the use of error correction code.

Asano discloses, in a magnetic disk storage system wherein data is written one sector at a time (page 3, paragraph 28), using an error correction code (ECC) block size larger than a physical sector size of the disk, a cumulative ECC parity state between partial writes of an ECC block being retained (page 8, paragraphs 107 and 108).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the ECC structure and operations of Asano in the disk system of the combination of Liu, Rosenblum, and Holland such that the log-structured file system uses the error correction code, since (1) the Asano system was specifically designed for use in disk storage, such as that of the combination of Liu, Rosenblum, and Holland (see Asano, figure 1) and (2) such a combination would have

provided protection against burst errors and random errors without incurring the delays of read-modify-write operations when sequentially writing large amounts of data (Asano, page 8, paragraph 107).

16. Claims 22-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Liu, Rosenblum, and Holland as applied to claim 19 above, and further in view of Ono.

(A) Regarding claim 22, the combination of Liu, Rosenblum, and Holland teaches all the limitations of claim 19 as shown above, and Liu shows shingled track writing (page 6, left hand column, lines 35-45). However, the combination of Liu, Rosenblum, and Holland does not disclose using a virtual address table when writing to the disk.

Ono teaches using a virtual address table (translation table) for accessing a magnetic disk wherein a virtual sector is assigned a replacement sector when a sector originally mapped to the virtual sector is corrupted (column 17, lines 34-44).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the virtual address table of Ono in the disk writing procedure of the combination of Liu, Rosenblum, and Holland, since (1) Ono was specifically designed to be used with disk storage, such as that of the combination of Liu, Rosenblum, and Holland (see Ono, Figure 1, element 4) and (2) such a combination would have maintained the integrity of the data being stored on a magnetic

disk storage apparatus without complicating the logic of the devices accessing the storage apparatus (Ono, column 17, lines 41-50).

(B) Regarding claim 23, the combination of Liu, Rosenblum, Holland, and Ono teaches all the limitations of claim 22 as shown above, and Ono shows that the VAT (translation table) maps virtual sector locations to actual sector locations (Ono, column 17, lines 26-40).

(C) Regarding claim 24, the combination of Liu, Rosenblum, Holland, and Ono teaches all the limitations of claim 22 as shown above, and Ono discloses that the VAT is stored in a location on the disk (Ono, column 17, lines 34-40). Furthermore, Liu shows that the storage locations on the disk consist of a region with non-overlapping tracks where random access writes can be performed, and a region with shingled written bands (Liu, page 6, paragraph 67). Additionally, Rosenblum shows that storage operations use a log structured approach (Rosenblum, page 3, left hand column, lines 36-41 through right hand column, lines 1-2).

(D) Regarding claim 25, the combination of Liu, Rosenblum, Holland, and Ono teaches all the limitations of claim 22 as shown above, and remapping sectors as required by an access to the disk (Ono, column 17, lines 34-44) wherein accessing the disk includes shingled track writing (Liu, page 6, left hand column, lines 35-45) and the RAID controller performs the logical to physical address translation for an access to a disk (Holland, column 4, lines 57-61).

(10) Response to Argument

Appellant has appealed the rejections based on 35 U.S.C. 112, second paragraph, and the rejections based on 35 U.S.C. 103. The provisional double patenting rejection has not been appealed.

In accordance with MPEP 1207.02(A)(10), the response below will use headings that parallel the headings utilized in the appellant's brief to address each of appellant's arguments.

In accordance with MPEP 1207.05, this Supplemental Examiner's Answer is made in response to a new issue raised in the Reply Brief filed on June 11, 2008. The new issue is addressed under the heading "Response to New Issue" at the end of this section.

This Supplemental Examiner's Answer will neither address nor concede aspersions cast upon the examiner with regard to fairness, impartiality, reading of the references, reliance on the previous examiner, legal confusion, etc. Only arguments on the merits are addressed below:

a. Obviousness Rejection of Claims 1, 2 and 4

(1) On page 5 of the appeal brief, the first paragraph of this section appellant attempts to distinguish the summation of check bytes in Asano et al. from the operation of the hard disk drive of claim 1 by stating that "the Asano et al. method works by summing check bytes, not data bytes." Appellant repeats this argument on page 8 of

the Appeal Brief, in the final paragraph of this section citing Asano's "summing stored check bytes and not the data bytes".

On the contrary, all bytes are data bytes. A byte is comprised of 8 bits of data. In the system of Asano, "check bytes" are ECC data bytes and "data bytes" are operand data bytes.

(2) On page 5 of the appeal brief, the second paragraph argues that Asano et al. "fails to implicate parity at all". Appellant relies on a narrow definition of parity, involving XORing data bytes, which is not commensurate in scope with the claims or the disclosure of the invention.

In the final rejection, the examiner pointed out that "*parity is a type of ECC*". On page 8 of the appeal brief, in the next to last paragraph of this section, appellant refers to the examiner's statement as "an unsupported allegation". This is not an allegation, it is a fact. Parity is probably the simplest example of an error correction code (ECC). ECC has parity (error detection bits) in it.

For this reason, while Asano does not explicitly mention parity, one of ordinary skill in the art would have recognized that the ECC check bytes of Asano et al. could comprise parity data. Furthermore, the claims are not directed to parity *per se*, but rather "ECC parity", an undefined term that is interpreted as that portion of *ECC* that is devoted to parity (i.e., error detection bits). Note the discussion of the rejection under 35 U.S.C. 112 regarding this language.

Returning to page 5, the second paragraph states that "Appellant has been able to discern nothing in Asano et al. about successive partial writes, much less retaining

anything between them, much less still retaining a cumulative ECC parity state." However, this was all explained in the text of the rejection, with reference to paragraphs 107 and 108 of Asano et al. The successive partial writes were made after writing to each sector. With regard to an ECC block being retained, note the summation of the check bytes in page 8, paragraphs 107 and 108. As for retaining a cumulative ECC parity “state”, language is indefinite for the reasons noted in the rejection under 35 U.S.C. 112, second paragraph; accordingly, this language has been interpreted for purposes of this rejection as being cumulative parity *data*.

(3) On page 6 of the appeal brief, the third and fourth paragraphs of this section are dedicated to the assertion that “while Rosenblum has been used for a teaching of a log-structure file system, nothing has been pointed to that the prior art recognizes using such a system for the use of Liu, or as a vehicle that uses the ECC system of Asano.” In response to the motivation to combine the references, appellant states "The proffered rationale - that tossing Rosenblum into Liu would achieve faster operation and fault recovery - are pure conjecture".

First, the language "faster operation and fault recovery" is taken from the Rosenblum reference itself (see Rosenblum, page 1, left hand column, lines 4-7 and page 9, right hand column, lines 14-30). As stated in the rejection, the Rosenblum patent was specifically designed to improve the performance with disk storage systems. It would not have required hindsight to make one of ordinary skill in the art consider the use of a data structure that was purported to improve disk drive performance by an entire order of magnitude (see the chart on page 6 of Rosenblum).

Appellant also relies on the assertion that Rosenblum does not discuss whether the data segments define bands or tracks on the disk. However, all storage disks have tracks. Some are arranged in concentric circles and others are form a long spiral, but all storage disks have them.

Second, the Rosenblum and Asano systems are not mutually exclusive. Both teach systems for improving fault tolerance. Rosenblum's log structure increases the speed of fault recovery. Asano's check bytes increase the accuracy of fault recovery. Such systems are not only compatible, but also complementary.

(4) The paragraph that spans pages 6-7 of the appeal brief attempts to divorce the present claims from the scope of KSR Int'l Co. v. Teleflex Inc., 127 S.Ct. 1727 (2007). To support this position, appellant states "Absent any technical evidence of record, how does the examiner know that a specific data structure would improve the operation of a type of data writing nowhere envisioned for use with the data structure – as opposed to a impede operation in actual implementation?"

In this statement, appellant sets forth an unusual standard for obviousness, whereas the legal standard is whether a combination would have been obvious to one having ordinary skill in the art at the time the invention was made. In this regard, the text of the rejection explicitly cites the required technical evidence in the prior art references and the rejection gives the motivation to combine the cited prior art references.

KSR Int'l Co. v. Teleflex Inc. does apply. In the case of Rosenblum, for example, the purported benefit of an order of magnitude increase in storage performance is not a

motivation that requires a considerable store of technical details. As for whether such performance was desired, faster operation and fault recovery were two of the three most important aspects of data processing system design (the third is cost).

(5) On page 7 of the appeal brief, the first full paragraph asserts that the burden of proof is on the examiner and states "No burden ever shifts away from a *prima facie* case that is illegitimately made". The examiner submits, however, that the rejections are complete inasmuch as the burden of proof of obviousness has been met. No convincing arguments have been presented to overcome these rejections.

(6) On page 7 of the appeal brief, the second full paragraph states that "nothing has been pointed to in Rosenblum to use an error correction code (ECC) block size larger than a physical sector size of the disk as recited in Claim 1, nor has any mention been pointed to in Asano et al. that might conceivably tie its ECCs to a log-structured file system".

First, the use of an error correction code (ECC) block size larger than a physical sector size was explicitly taught by Asano in paragraph 63. Second, for the reasons outlined above, Rosenblum and Asano teach compatible and complementary systems for improving fault recovery in disk storage devices.

Second, appellant states "All the examiner has done is in effect lifted statements from the references extolling their benefits in contexts that are different from the proposed combination advanced in the Office action". However, citing statements from references, setting forth the benefits of the references as part of a motivation to combine, and describing how the contexts of the references are compatible in a single

proposed combination are all required for a well-reasoned rejection under 35 U.S.C. 103, when two or more references are relied upon.

If each of the references taught or suggested the features of each of the other references, as required by appellant, then only one of these references would be needed to make a rejection under 35 U.S.C. 103.

b. Obviousness Rejection of Claim 3

Claim 3 has not been separately argued and will stand or fall with claim 1 (see page 8 of the appeal brief).

c. Obviousness Rejections of Claims 6 and 8

Claims 6 and 8 have not been separately argued and will stand or fall with claim 1 (see page 9 of the appeal brief).

d. Obviousness Rejections of Claim 9

Claim 9 has not been separately argued and will stand or fall with claim 1 (see page 9 of the appeal brief).

e. Obviousness Rejections of Claims 10, 11, 15 and 16

On page 9 of the appeal brief, the first two paragraphs of this section suggest that since each of the Ono et al., Liu et al. and Rosenblum et al. references do not teach or suggest the features of each of the other references, there is no motivation to

combine them. As stated above, appellant sets forth an unusual standard for obviousness, whereas the legal standard is whether a combination would have been obvious to one having ordinary skill in the art at the time the invention was made. If each of the references taught or suggested the features of each of the other references, as required by appellant, then only one of these references would be needed to make a rejection under 35 U.S.C. 103.

In this regard, the text of the rejection explicitly cites the required technical evidence in the prior art references and the rejection gives well-reasoned motivations to combine the cited prior art references. For the reasons set forth in the rejections, the shingled writing of Liu, the log structure of Rosenblum and the virtual address tables are compatible *and* complementary systems. The systems are compatible because each was designed for use in disk storage. The systems are complementary because the combination of the references would produce a system having the benefits set forth in the rejection, such as faster writing and fault tolerance.

f. Obviousness Rejection of Claim 12

Claim 12 has not been separately argued and will stand or fall with claim 10 (see page 10 of the appeal brief).

g. Obviousness Rejection of Claim 13

Claim 13 has not been separately argued and will stand or fall with claim 10 (see page 10 of the appeal brief).

h. Obviousness Rejections of Claims 18 and 19

On page 10 of the appeal brief, appellant reiterates the argument that the references do not teach or suggest the each other's features, specifically that "a log-structured file system as taught in Rosenblum et al. has not heretofore been suggested for use in shingled track writing". This argument alone, however, fails to prove that it would not have been obvious to one of ordinary skill in the art, having the Rosenblum and Liu references before him, to incorporate a log-structured file system in a system for use with shingled track writing. Appellant's argument is not sufficient to overcome the rejection under 35 U.S. 103.

Appellant further states "The only response the examiner has been able to muster to this argument on page 20 of the Office action is the above-noted irrelevant argument concerning 'intended use'." However, page 20 of the final office action was directed to claims 22, 23 and 24, not to claims 18 and 19.

i. Obviousness Rejection of Claim 20

Claim 20 has not been separately argued and will stand or fall with claims 18 and 19 (see pages 10 and 11 of the appeal brief).

j. Obviousness Rejection of Claim 21

Claim 21 has not been separately argued and will stand or fall with claims 18 and 19 (see page 11 of the appeal brief).

k. Obviousness Rejections of Claims 22-25

Claims 22-25 have not been separately argued and will stand or fall with claims 18 and 19 (see page 11 of the appeal brief).

l. Indefiniteness Rejections, Claims 1-4, 6-9

With regard to the rejection under 35 U.S.C. 112, second paragraph, this is directed to the language "A cumulative ECC parity state between successive partial writes of an ECC block is retained" is vague and unexplained either in the context of the claims or in the specification.

In the rejection, the examiner noted that "ECC parity" and an "ECC parity state" is unclear and undefined and that it is unclear how a "state" can be "cumulative". Appellant has failed to explain how a "state" can be "cumulative". In response to this request for clarification, appellant states "All that is alleged by way of rationalizing the allegation is a rhetorical question. Rhetorical questions are no substitute for MPEP analysis."

(1) Appellant relies on an analysis under MPEP 2173.02. However, such an analysis is useless unless appellant can provide an unambiguous explanation of how a "state" can be made "cumulative".

(2) Appellant relies on a dictionary definition of “cumulative”, but does not explain how a "state" can be increased "in effect, size, by successive additions".

(3) Applicant further relies on page 8 of the specification, which does not discuss ECC blocks at all.

In fact, in the specification, there are only two places where ECC is ever mentioned:

- In the first full paragraph of page 4, “A cumulative ECC parity state between successive partial writes of an ECC block is retained”. Since this language is repeated verbatim in claim 1, page 4 provides the necessary antecedent basis; however, there is no further explanation of what it actually means.
- In the third full paragraph on page 10, is written, “large error correction (ECC) block sizes within each segment (band) are implemented by storing the intermediate ECC parity state after each partial write of an ECC block". This language teaches that only *intermediate* parity states are stored after partial writes.

Neither of these passages provides any explanation of how any accumulation and/or summation of states *per se* occurs to lead to "A cumulative ECC parity state".

(4) In the rejections above, the examiner has interpreted a cumulative ECC parity state as being cumulative ECC *data*, more specifically, the parity or error detection portion of such data. Given the examiner’s interpretation, storing the intermediate ECC parity state after each partial write of an ECC block makes perfect

sense. What does not make sense is how such states can be made *cumulative*. Did appellant mean to say that the ECC parity states are carried through some type of sequence? If so, then this feature has not been properly claimed. If not, then where does the accumulation occur and how can something be added to a "state"? Or did appellant mean that the parity data itself, as opposed to a state, is accumulated after each partial write? Neither the claims nor the disclosure is clear on this point. In fact, appellant's response to the rejection is not clear on this point either, which is perhaps the most convincing evidence of indefiniteness.

<u>Response to New Issue</u>

The reply brief filed on June 11, 2008 raises one new issue.

On page 2 of the reply brief, Appellant states "parity is not an error *correction* concept but an error *detection* concept".

Up to this point in prosecution, the rejections have been written based on a reasonable interpretation of "ECC parity" as that portion of an ECC devoted to parity data (i.e. error detection), which is ECC nevertheless.

If, however, appellant now wants the claim limitation "ECC parity" to mean simply "error detection" ("parity"), without invoking error correction, then why use the term "ECC parity"? Did appellant mean "ECC and parity" instead? If so, why would appellant's invention need both "parity" and "ECC" simultaneously?

"ECC" and "parity" were well known terms of art. "ECC" means "error correction code", and provided both error detection and correction of data in memory. "Parity" was

an earlier, simpler form which provided error detection only, but such detection was almost universally used to facilitate a subsequent correction. However, "ECC parity" *per se* is not a term of art, nor has it been defined in appellant's disclosure.

In the absence of any clear definition in appellant's disclosure or remarks for "ECC parity" or "ECC parity state", the examiner's interpretation of this to mean the parity data (i.e. error detection) portion of an ECC stands.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/B. James Peikari/

Primary Examiner, Art Unit 2189

Conferees:

/Reginald G. Bragdon/

Supervisory Patent Examiner, Art Unit 2189

/Manorama Padmanabhan/

WQAS, TC2100, WG2180

Responsive to the reply brief under 37 CFR 41.41 filed on June 11, 2008, a supplemental Examiner's Answer is set forth above.

Appellant may file another reply brief in compliance with 37 CFR 41.41 within two months of the date of mailing of this supplemental examiner's answer. Extensions of time under 37 CFR 1.136(a) are not applicable to this two month time period. See 37 CFR 41.43(b)-(c).

A Technology Center Director or designee has approved this supplemental examiner's answer by signing below:

/Jack Harvey/

Director, Technology Center 2100